

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
24 June 2004 (24.06.2004)

PCT

(10) International Publication Number
WO 2004/053234 A1

(51) International Patent Classification⁷: **E01F 9/00**,
15/00, 13/00, G09F 7/22

John [AU/AU]; 45 Outlook Drive, Eaglemont, Victoria
3084 (AU).

(21) International Application Number:
PCT/AU2003/001648

(74) Agents: **HIND, Raymond, S. et al.**; Davies Collison Cave,
1 Nicholson Street, Melbourne, Victoria 3000 (AU).

(22) International Filing Date: 9 December 2003 (09.12.2003)

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR,
CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD,
GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,
MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU,
SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2002953249 10 December 2002 (10.12.2002) AU

(84) Designated States (*regional*): ARIPO patent (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,
SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (*for all designated States except US*):
**TRANSURBAN INFRASTRUCTURE DEVEL-
OPMENTS LIMITED** [AU/AU]; Level 43, Rialto South
Tower, 525 Collins Street, Melbourne, Victoria 3000 (AU).

(72) Inventors; and

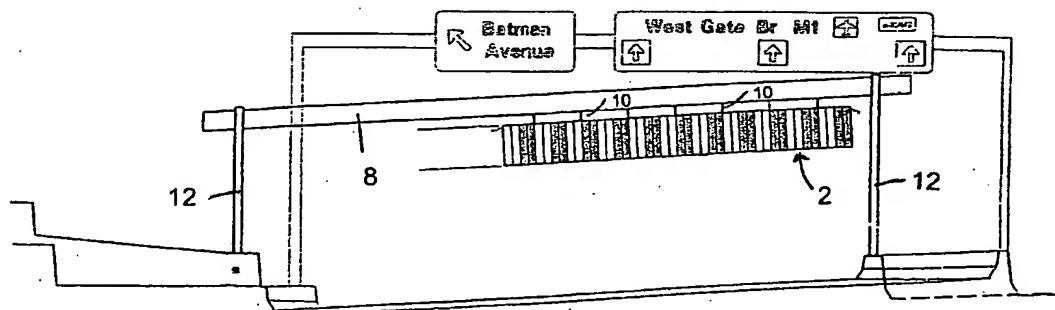
(75) Inventors/Applicants (*for US only*): **CORKER, Bill**
[AU/AU]; c/- Denton Corker Marshall, 49 Exhibition
Street, Melbourne, Victoria 3000 (AU). **WHYTCROSS,**
Garry [AU/AU]; c/- Hyder Consulting, Level 16, 31
Queen Street, Melbourne, Victoria 3000 (AU). **HOWELL,**

Published:

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: OVER-HEIGHT VEHICLE BARRIERS



(57) Abstract: An over-height vehicle barrier has a supporting beam mounted above a carriageway, with multiple blade-like mem-
bers rotatably mounted to the supporting beam such that the blade-like members are suspended downwardly from the beam in parallel
relationship and in close proximity one to another. A leading edge of each member faces oncoming traffic on the carriageway for
possible engagement by an over-height vehicle such that each member can rotate about the axis of the beam independently of the
other members when struck by an over-height vehicle. A further beam is engageable by the rotating members when struck by a
vehicle to limit the extent of rotation about the axis of the beam and to thereby cause the members to rotate in a return direction.
Engagement of the members by a vehicle generates a warning noise to alert the driver of the vehicle and the further beam itself can
generate further additional noise when engaged by the rotating members.

WO 2004/053234 A1

WO 2004/053234

PCT/AU2003/001648

4/PORTS

10/538180

JC17 Rec'd PCT/PTO 09 JUN 2005

OVER-HEIGHT VEHICLE BARRIERS

The present invention relates to over-height vehicle barriers for installation in advance of a road tunnel, a bridge or other structure where vehicle height limitations apply.

5 It is common practice to install on a roadway in advance of a tunnel, a bridge, or other structure where a height limitation applies, a over-height barrier which will be contacted by an over-height vehicle before the vehicle actually reaches the height-restricted zone of the tunnel, bridge or other structure.

10 One prior form of over-height vehicle barrier consists of a heavy beam rigidly mounted, the objective of the beam being to physically stop the over-height vehicle before it comes into contact with the structure being protected. This is not particularly satisfactory as engagement with the beam can result in part of an over-height load being dislodged into the path of other vehicles and also engagement with the beam may cause the vehicle to stop very suddenly, also presenting a danger to following vehicles and vehicles
15 in adjacent lanes. When the beam is struck, its supporting structure will be subject to substantial impact loading; as, sometimes, such beams are mounted directly to a bridge or tunnel entrance, some damage may still result to the structure intended to be protected.

A variation of the fixed rigid beam over-height barrier is a sliding beam barrier consisting of a heavy beam mounted on rails which enable the beam to be pushed in the
20 direction of traffic flow by an over-height vehicle. The vertical clearance between the rails and the road increases so that as the beam is pushed further along the rails the extent of interference is diminished. However if the vehicle is higher than the beam clearance at the far end of its travel, the results will be similar to those experienced using the fixed rigid beam as discussed above. In addition, due to the weight of the beam it is still possible for
25 the beam to dislodge part of the vehicle's load into the path of other vehicles.

Another prior form of over-height barrier comprises a heavy beam or weights suspended by chains or cables from a supporting structure. This is also unsatisfactory in some situations, as there is a risk that part of the load might become entangled within the chains or cables if the load is excessively high as may arise with a carrier for earth-
30 working machinery having a long boom arm which can extend to a substantial height even when parked for transportation. This may result in parts of the barrier including its supporting structure being damaged or dislodged. Also, again, due to the weight of the

WO 2004/053234

PCT/AU2003/001648

- 2 -

barrier, part of the over-height load of the vehicle may become dislodged into the path of other vehicles.

According to the present invention there is provided an over-height vehicle barrier, said barrier having a series of over-height vehicle engaging members mounted in closely-spaced relationship on a supporting beam mounted above a carriageway such that each member hangs beneath the beam for possible engagement by an over-height vehicle, each member being pivotally mounted to the beam at an upper end portion thereof such that each member can pivot about the axis of the beam independently of the other members when struck by an over-height vehicle, and a further beam, spaced from the supporting beam to be engaged by said members pivoting about the supporting beam when struck by an over-height vehicle and to thereby cause the members to pivot in a return direction, engagement of said members by a vehicle generating a warning noise to alert the driver of the vehicle.

In a preferred embodiment of the invention each of the engaging members is in the form of a blade with substantially flat parallel sides, the blade preferably being of downwardly tapering profile when viewed from the side.

Advantageously the supporting beam is of circular cross section to provide a direct pivotal mounting for each blade.

The blades are each of a semi-rigid structure capable of deforming upon impact to absorb energy. In one preferred form, the blades are composed of polyurethane.

The further beam against which the blades impact is preferably a gantry beam from which the supporting beam is rigidly mounted so that the supporting beam lies beneath the gantry beam. The gantry beam is preferably a tube of circular section so that when impacted by the pivoting blades the gantry beam will generate a loud resonant noise.

Further according to the invention there is provided an over-height vehicle barrier, said barrier having a series of over-height vehicle engaging members mounted in closely-spaced relationship on a supporting beam mounted above a carriageway such that each member hangs beneath the beam for possible engagement by an over-height vehicle, each member being mounted to the beam at an upper end portion thereof by a rotary bearing arrangement such that each member can swing about the axis of the beam independently of the other members when struck by an over-height vehicle, and a further beam spaced above the supporting beam to be engaged by said members swinging about the supporting

WO 2004/053234

PCT/AU2003/001648

- 3 -

beam when struck by an over-height vehicle and to thereby cause the members to swing in a return direction, engagement of said members by a vehicle generating a warning noise to alert the driver of the vehicle.

Still further according to the invention there is provided an over-height vehicle
5 barrier, said barrier having a series of over-height vehicle engaging members mounted in
closely-spaced relationship on a supporting beam of circular cross-section mounted above
a carriageway such that each member hangs beneath the beam for possible engagement by
an over-height vehicle, each member being mounted to the beam by a rotary bearing at an
upper end portion of the member such that each member can swing about the axis of the
10 beam independently of the other members when struck by an over-height vehicle, and
means spaced from the supporting beam to be engaged by said members swinging about
the supporting beam when struck by an over-height vehicle and to thereby cause the
members to swing in a return direction, each said member being composed of a material
which is resiliently deformable when struck by an over-height vehicle to absorb energy
15 upon impact, engagement of said members by a vehicle generating a warning noise to alert
the driver of the vehicle.

Still further according to the invention there is provided an over-height vehicle
barrier, said barrier having a supporting beam mounted above a carriageway, multiple
blade-like members rotatably mounted to the supporting beam such that the blade-like
20 members are suspended downwardly from the beam with the members being arranged in
parallel relationship in close proximity one to another with a leading edge of each member
facing oncoming traffic on the carriageway for possible engagement by an over-height
vehicle such that each blade-like member can rotate about the axis of the beam
independently of the other members when struck by an over-height vehicle, and means
25 engageable by the rotating members when struck by a vehicle to limit the extent of rotation
about the axis of the beam and to thereby cause the members to rotate in a return direction,
each said member being composed of a material which is resiliently deformable when
struck by an over-height vehicle to absorb energy upon impact, engagement of said
members by a vehicle generating a warning noise to alert the driver of the vehicle.

30 An embodiment of the invention will now be described by way of example only
with reference to the accompanying drawings in which:

Figure 1 shows schematically an over-height vehicle barrier installed above a

WO 2004/053234

PCT/AU2003/001648

- 4 -

carriageway;

Figure 2 is a front view to an enlarged scale showing part of the structure of the barrier including supporting beam, pivotal or swinging blades mounted from the supporting beam, and a gantry beam which carries the supporting beam;

5 Figure 3 is a side view showing the gantry beam and hanger plates by which the supporting beam is mounted from the gantry beam; and

Figure 4 is a side view to a further enlarged scale showing one of the blades.

The over-height vehicle barrier in accordance with the preferred embodiment of the invention comprises a series of separate blades 2 mounted in closely-spaced relationship
10 along the length of a supporting beam 4 (see Figure 2) in such a manner as to enable the blades 2 individually to freely pivot or swing about the axis of the supporting beam 4. For this purpose, in the preferred embodiment, the supporting beam 4 consists of a rigid metal tube of circular cross section on which each blade 2 is rotatably mounted by a suitable bearing arrangement 6 within the upper end portion of the blade 2 and through which the
15 tube extends. The supporting beam 4 itself is carried from a gantry beam 8 by hanger plates or struts 10 welded to the gantry beam 8 and extending downwardly from the gantry beam 8 so that supporting beam 4 is located beneath the gantry beam 8 and is vertically spaced therefrom. The depth of the supporting beam 4 beneath the gantry beam 8 is such that the presence of the gantry beam 8 inhibits complete rotation of the blades 2 about the
20 supporting beam 4 for reasons to be described subsequently. The gantry beam 8 is itself preferably also a tubular beam of circular cross section.

In the particular configuration shown in Figure 1, only some of the lanes of the carriageway require over-height protection and the beam 4 with blades 2 is only positioned above those lanes, whereas the gantry beam 8 spans the entire carriageway and is
25 supported at each end by posts 12. Other supporting structure for the gantry beam 8 can alternatively be provided and it will be understood that the actual configuration of the beam 4 with blades 2 in relation to the carriageway will be determined by the over-height protection to be provided on a site-by-site basis.

Each of the blades 2 is of a constant width when viewed from the front of the
30 barrier (see Figures 1 and 2) with flat parallel sides and tapers towards its lower end when viewed from the side as shown in Figure 4, with the leading edge of each blade facing in the direction of the oncoming traffic. Preferably the blades are formed of a semi-rigid

WO 2004/053234

PCT/AU2003/001648

- 5 -

plastics material such as polyurethane with a structure which enables the blade to deform and absorb energy when struck by an over-height part of a vehicle travelling through the barrier.

Each blade 2 has a substantial length, for example between 1.3 and 1.5 metres so as to provide a substantial projection beneath the supporting beam 4. Accordingly, the beam 4 can be mounted at such a height above the carriageway that the likelihood of that beam being struck even by a load which is excessively over-height is extremely small.

As discussed above, each blade 2 is of substantially constant width when viewed from the front of the barrier and the blades 2 are mounted in closely spaced relationship along the length of the beam 4, being separated for example by washers 14. Accordingly, when viewed by the driver of an approaching vehicle, the array of closely spaced blades 2 itself gives the appearance of a solid beam and this sense can be increased by differently colouring adjacent groups of blades in contrasting colours, typically black and yellow, to give the impression of vertical warning stripes along the length of the seemingly solid beam as shown in Figure 1.

In the event that the barrier is struck by an over-height vehicle, which could be travelling at speeds up to 80 km/hr, the leading edges of those blades 2 engaged by the over-height part of the vehicle will be struck with a high impact force and will swing upwardly around the supporting beam 4 at relatively high velocity to engage the rear side of the gantry beam 8. Upon engagement with the gantry beam 8, the blades 2 will be deflected downwardly in the reverse direction. The actions which have just been described will typically take place within a fraction of a second. If the over-height part is of sufficient length the blades may be re-engaged and swung against the gantry beam 8 one or more further times. The initial impact of the vehicle with the blades 2 will generate noise as will any subsequent impact following deflection by the gantry beam 8. The gantry beam 8 itself, being hollow, will also generate substantial noise when struck by the swinging blades 2. Accordingly, engagement of the vehicle with the blades 2 will create a significant impact noise which should suggest to the driver that significant impact damage may have arisen thereby inducing the driver to stop. However, due to the semi-rigid nature of the structure of the blades 2 and the mounting of the blades 2 on the supporting beam 4 for free pivotal movement, engagement of the blades 2 by the vehicle will be unlikely to dislodge part of its load into the path of other vehicles even if the over-height part causes

WO 2004/053234

PCT/AU2003/001648

- 6 -

several return impacts on the blades 2. Moreover the barrier, although providing a very loud and distinct warning which should induce the driver to stop, will not actually stop the vehicle itself with consequential risk of collision with other vehicles. When the vehicle has stopped beyond the barrier, it is then able to be reversed back through the barrier, with
5 the blades 2 then being pivoted upon engagement with the over-height part in the reverse direction to permit passage of the vehicle. Under these conditions the vehicle will be travelling quite slowly and engagement of the blades with the over-height part will simply allow the blades to lift and allow passage of the vehicle.

The barrier described also permits the passage of authorised over-height vehicles to
10 pass through the barrier under permitted and controlled conditions.

Although the configuration just described particularly convenient and is effective and is the preferred configuration, nevertheless in alternative configurations, the swinging blades, instead of engaging a gantry beam which limits their rotation and causes movement in the return direction, the blades could alternatively engage other structure having a
15 similar function, for example a tensioned cable. Although the tensioned cable will not generate the resonant noise which would be typical of a hollow metal beam when struck, nevertheless significant noise will still be generated by impact of the vehicle with the blades both initially and on their return movement.

The blades must be of robust construction to withstand repeated impact with
20 vehicles while being capable of deflection to absorb energy upon impact. The blades should also be of relatively light weight to reduce centrifugal and inertial forces on impact to prevent dislodging of part of the load and also to prevent damage to the supporting structure. Blades constructed principally from polyurethane are suitable for this purpose. The bearing arrangement 6 and associated structure incorporated into the upper part of the
25 blade 2 as an integral part during manufacture is such as to permit the blades 2 individually to be removed and replaced on the supporting beam 4 with the beam 4 remaining *in situ*.

The embodiment has been described by way of example and modifications are possible within the scope of the invention.

WO 2004/053234

PCT/AU2003/001648

- 7 -

CLAIMS:

1. An over-height vehicle barrier, said barrier having a series of over-height vehicle engaging members mounted in closely-spaced relationship on a supporting beam mounted above a carriageway such that each member hangs beneath the beam for possible engagement by an over-height vehicle, each member being pivotally mounted to the beam at an upper end portion thereof such that each member can pivot about the axis of the beam independently of the other members when struck by an over-height vehicle, and a further beam spaced from the supporting beam to be engaged by said members pivoting about the supporting beam when struck by an over-height vehicle and to thereby cause the members to pivot in a return direction, engagement of said members by a vehicle generating a warning noise to alert the driver of the vehicle.
2. A barrier according to claim 1, wherein each of the engaging members is in the form of a blade with substantially flat parallel sides and having a leading edge facing the oncoming traffic.
3. A barrier according to claim 2, wherein each blade is of downwardly tapering profile when viewed from the side.
4. A barrier according to claim 2 or claim 3, wherein the supporting beam is of circular cross section to provide a direct pivotal mounting for each blade.
5. A barrier according to any one of claims 2 to 4, wherein the blades are each of a semi-rigid structure capable of deforming upon impact to absorb energy.
6. A barrier according to claim 5, wherein the blades are composed principally of polyurethane.
7. A barrier according to any one of claims 1 to 6, wherein the further beam against which the members impact is a gantry beam from which the supporting beam is rigidly

WO 2004/053234

PCT/AU2003/001648

- 8 -

mounted so that the supporting beam lies beneath the gantry beam.

8. A barrier according to claim 7, wherein the gantry beam is a tube of circular section so that when impacted by the pivoting members the gantry beam will generate a loud resonant noise.

9. A barrier according to any one of claims 1 to 6, wherein said further beam is a tube of circular section so that when impacted by the pivoting members, the gantry beam will generate a loud resonant noise.

10. An over-height vehicle barrier, said barrier having a series of over-height vehicle engaging members mounted in closely-spaced relationship on a supporting beam mounted above a carriageway such that each member hangs beneath the beam for possible engagement by an over-height vehicle, each member being mounted to the beam at an upper end portion thereof by a rotary bearing arrangement such that each member can swing about the axis of the beam independently of the other members when struck by an over-height vehicle, and a further beam spaced above the supporting beam to be engaged by said members swinging about the supporting beam when struck by an over-height vehicle and to thereby cause the members to swing in a return direction, engagement of said members by a vehicle generating a warning noise to alert the driver of the vehicle.

11. An over-height vehicle barrier, said barrier having a series of over-height vehicle engaging members mounted in closely-spaced relationship on a supporting beam of circular cross-section mounted above a carriageway such that each member hangs beneath the beam for possible engagement by an over-height vehicle, each member being mounted to the beam by a rotary bearing at an upper end portion of the member such that each member can swing about the axis of the beam independently of the other members when struck by an over-height vehicle, and means spaced from the supporting beam to be engaged by said members swinging about the supporting beam when struck by an over-height vehicle and to thereby cause the members to swing in a return direction, each said member being composed of a material which is resiliently deformable when struck by an over-height vehicle to absorb

WO 2004/053234

PCT/AU2003/001648

- 9 -

energy upon impact, engagement of said members by a vehicle generating a warning noise to alert the driver of the vehicle.

12. A barrier according to claim 10 or claim 11, wherein each of the engaging members is in the form of a blade with substantially flat parallel sides and having a leading edge facing the oncoming traffic.

13. An over-height vehicle barrier, said barrier having a supporting beam mounted above a carriageway, multiple blade-like members rotatably mounted to the supporting beam such that the blade-like members are suspended downwardly from the beam with the members being arranged in parallel relationship in close proximity one to another with a leading edge of each member facing oncoming traffic on the carriageway for possible engagement by an over-height vehicle such that each member can rotate about the axis of the beam independently of the other members when struck by an over-height vehicle, and means engageable by the rotating members when struck by a vehicle to limit the extent of rotation about the axis of the beam and to thereby cause the members to rotate in a return direction, each said member being composed of a material which is resiliently deformable when struck by an over-height vehicle to absorb energy upon impact, engagement of said members by a vehicle generating a warning noise to alert the driver of the vehicle.

14. A barrier according to claim 13, wherein the means engageable by the rotating members when struck is a tube mounted above the beam and substantially parallel thereto to generate a loud resonant noise when impacted by the rotating members.

WO 2004/053234

1/4

10/538180
PCT/AU2003/001648

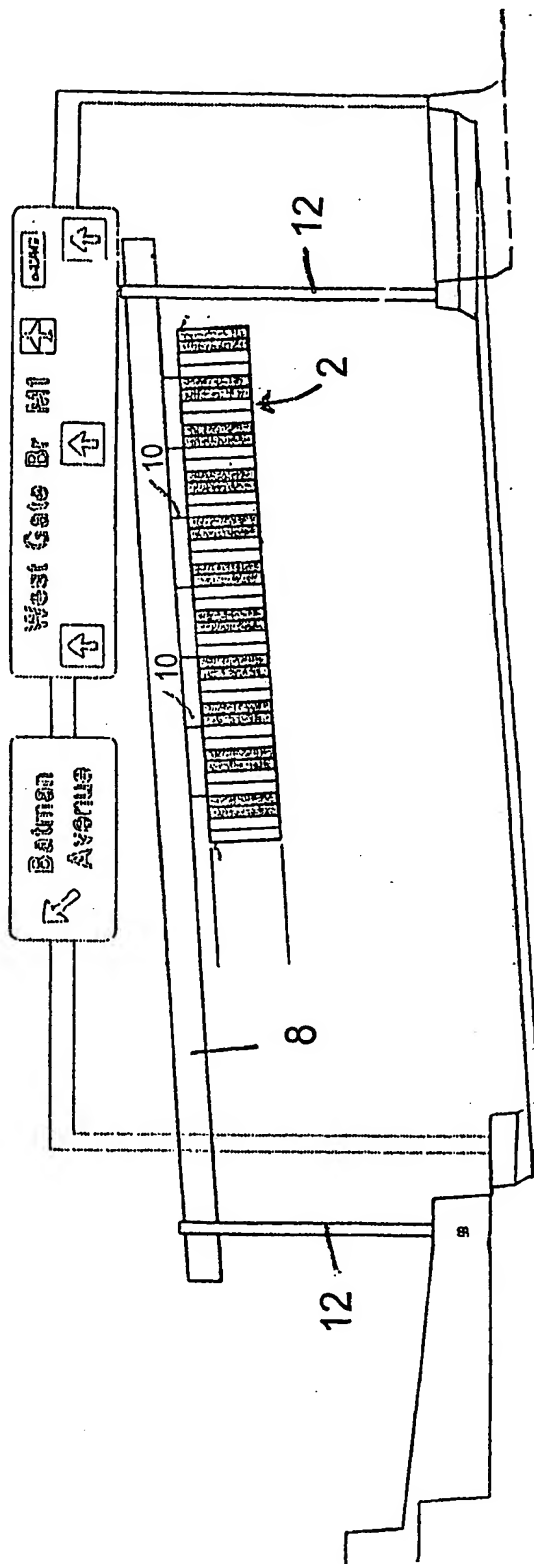


FIG. 1

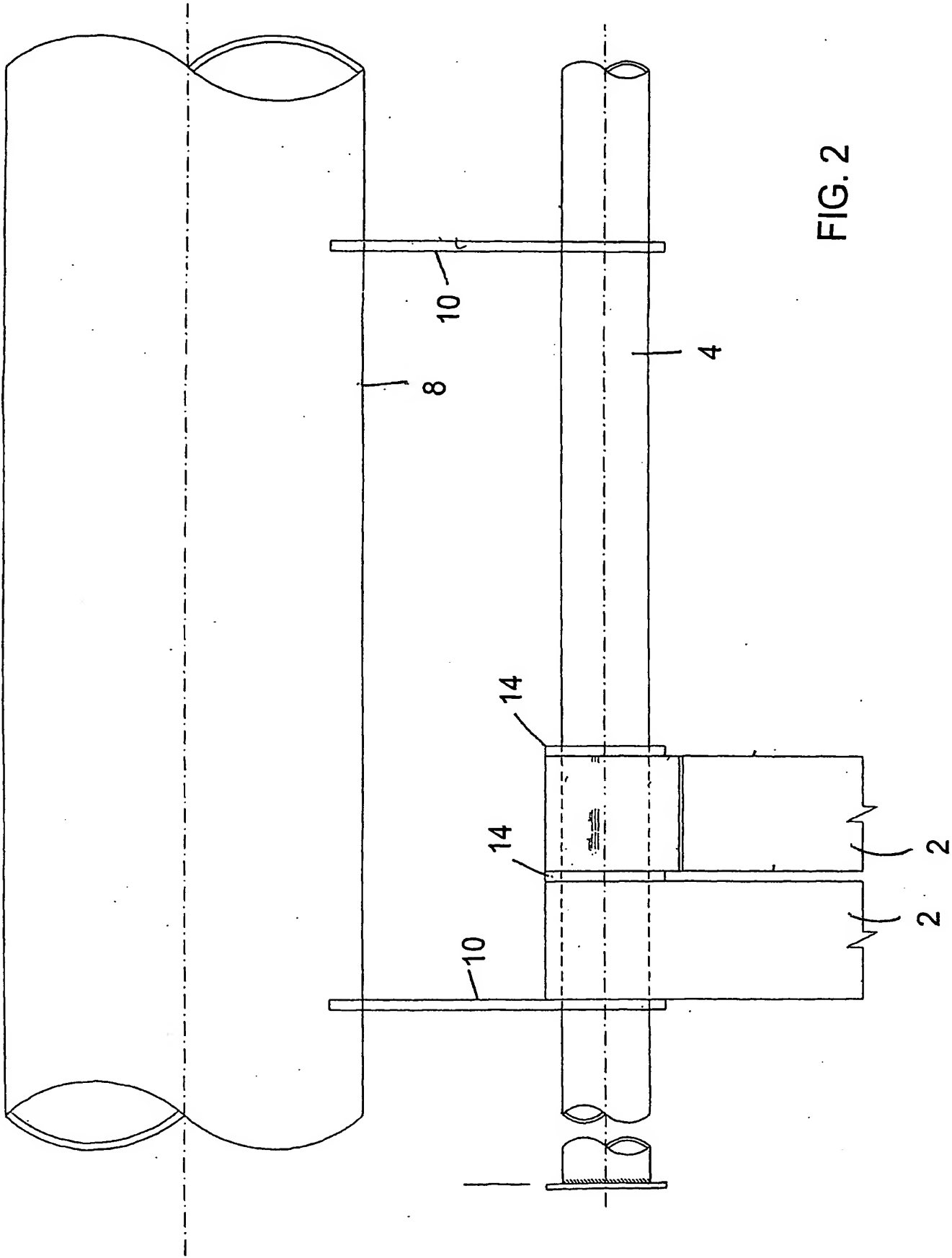
10/538180

PCT/AU2003/001648

WO 2004/053234

2/4

FIG. 2



WO 2004/053234

10/538180

3/4

10/538180
PCT/AU2003/001648

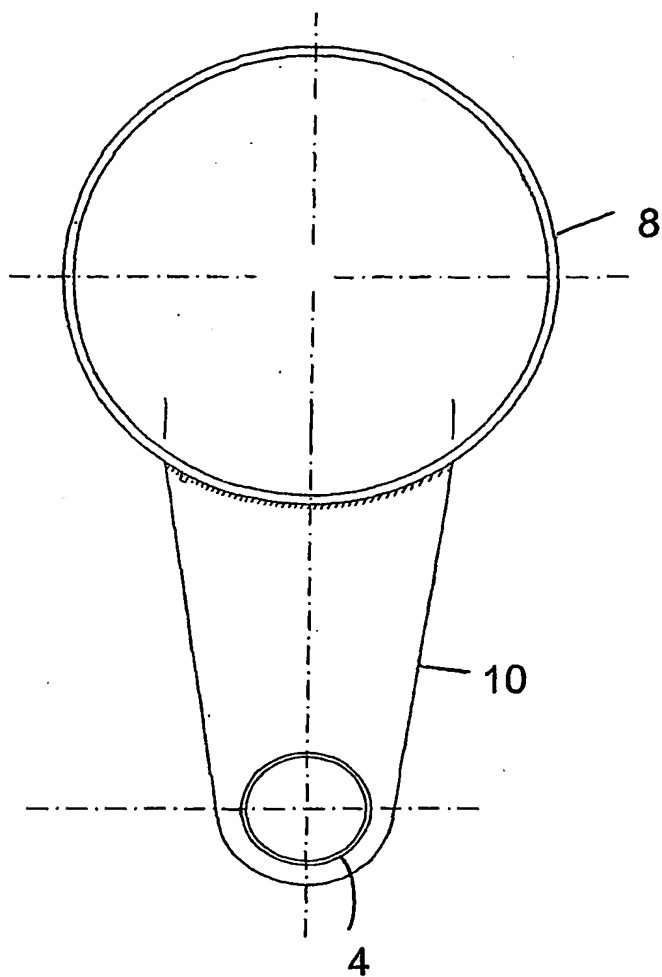


FIG. 3

10/538180

WO 2004/053234

PCT/AU2003/001648

4/4

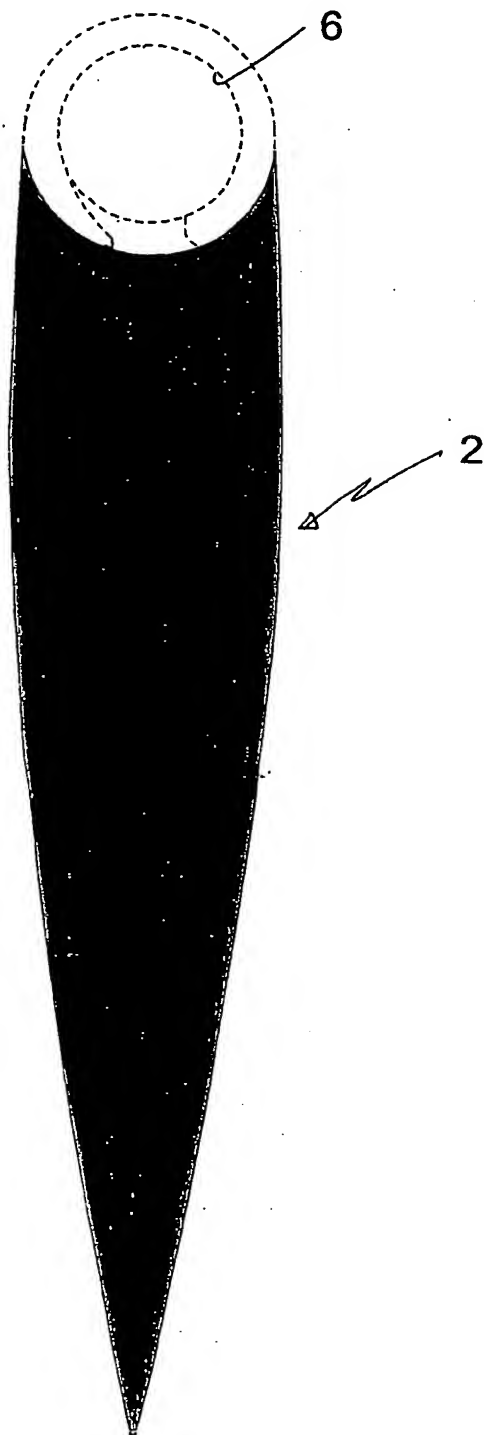


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2003/001648

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl. 7: E01F 9/00, 15/00, 13/00, G09F 7/22		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : E01F 9/00, 15/00, 13/00, G09F 7/22		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Derwent Patents File : Dwpi : ipc + headroom, height, high, overheight		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5474016 A (HANEY) 12 December 1995. All document.	
A	FR 2768447 A (SOCIETE AUXILIAIRE DE CONSTRUCTION D'OUVRAGES SACO SOCIETE ANONYME) 19 March 1999. All document.	
A	US 4346666 A (ISO) 31 August 1982. All document.	
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>		
Date of the actual completion of the international search 23 February 2004		Date of mailing of the international search report 8 MAR 2004
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929		Authorized officer DAVID LEE Telephone No : (02) 6283 2107

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2003/001648

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member
US 5474016	_____
FR 2768447	_____
US 4346666	_____
END OF ANNEX	